

MISCELLANEOUS PHENOMENA.

DROUTH.

Drouth prevailed in north and south Florida, Mississippi, Louisiana, Arkansas, Maryland, Pennsylvania, east-central and west New York, central Massachusetts, Tennessee, Ohio, Indiana, Iowa, Michigan, Wisconsin, Minnesota, and North and South Dakota. At Key West, Fla., a water famine was averted by opening to the public large cisterns at Fort Taylor and the Barracks. In Georgia the drouth was broken on the 4th. In South Carolina the first half of the month was dry. In Mississippi all vegetation was in need of rain at the close of the month. In Louisiana the drouth was the most prolonged of any noted since the establishment of Signal Service stations, and vegetation suffered severely, notably in the south part of the state. In north Arkansas the month was reported the driest May since 1881, and crops were suffering. In Virginia, West Virginia, and Maryland the early part of the month was very dry. In parts of Pennsylvania and New York crops were retarded and injured by dry weather. In central Massachusetts drouth prevailed during the month. In Tennessee the drouth, which prevailed almost unbroken, was the most severe experienced in many years, more especially in the middle and eastern divisions, and was very damaging to crops. In Ohio, Indiana, and Kentucky the dry spell was broken by rain on the 20th and 21st. In Iowa the early part of the month was very dry and unfavorable for grain. In Michigan all parts of the state, except the southwest portion, suffered from drouth which began April 21st and was not broken until May 20th. In Wisconsin severe drouth prevailed, except in south, west, and northwest parts of the state. In Minnesota and the Dakotas the drouth was broken on the 18th and 19th, previous to which dates crops were in a bad condition.

FOREST FIRES.

On the 1st forest fires were raging in the pine and cranberry districts of south New Jersey, and near Reading and Wellsborough, Pa., and Newburgh, N. Y. In central Pennsylvania the forest fires of the first half of the month destroyed an immense amount of valuable timber and property. From the 9th to 21st forest fires raged in the upper part of the peninsula of Michigan, destroying thousands of acres of timber. The villages of Clinton, Altona, and Walkersville were reported destroyed, and dense smoke interrupted navigation on the Straits of Mackinac. Forest fires caused great damage in Douglas Co., Wis., and about Duluth, Minn.

SUN SPOTS.

Mr. D. E. Hadden, Alta, Iowa: 1st, 3 groups; group in faculæ nw. disappearing by solar rotation. 2d, 2 groups, 3 spots; large spot disappearing by rotation; faculæ by rotation in on e. and se. limbs. 5th, 2 groups, 9 spots; groups in large areas; faculæ by rotation on se. and ne. limbs 1 day in. 6th, 2 groups, 7 spots; faculæ w. disappearing by rotation. 7th, 2 groups, 7 spots. 8th, 3 groups, 11 spots; new group with faculæ by rotation; aurora preceding evening. 9th, 3 groups. 10th, 3 groups, 25 spots. 11th, 5 groups, 20 spots; group faculæ by rotation e. limb; new group e. limb, and faculæ nw. 12th, 5 groups; new group by rotation se. limb. 13th, 5 groups, 12 spots; faculæ by rotation e. limb; extensive area of faculæ nw.; aurora in evening to 3 a. m. 14th, 14th,

5 groups, 10 spots; aurora in evening to 3.30 a. m. 15th, 15th, 4 groups. 16th, 3 groups, 9 spots; group by rotation e. limb. 17th, 3 groups. 18th, 4 groups, 13 spots; new group by rotation se. limb; faculæ by rotation. 19th, 5 groups; 24 spots; new group with faculæ by rotation in on e. limb; faculæ by rotation e. limb; group very extensive. 22d, 5 groups. 23d, 4 groups, 32 spots; prominent faculæ w. and sw. 24th, group by rotation se. limb. 25th, 5 groups, 26 spots; 3 groups n., 2 groups s. latitude. 26th, 5 groups, 25 spots. 27th, 5 groups, 27 spots; group w. limb disappearing by rotation. 28th, 3 groups; new group with faculæ by rotation e. limb; aurora preceding evening. 29th, 4 groups, 23 spots; faculæ by rotation e. limb. 30th, 3 groups, 13 spots. 31st, 3 groups, 13 spots; group faculæ by rotation on e. limb.

Mr. John W. James, Riley, Ill.: 1st, large spot of April 30th disappeared by solar rotation. 5th, 1 large and 2 small spots 1 day in on east edge, in south latitude; faculæ near east edge, north latitude. 7th, 1 new spot 3 days in east. 10th, 2 new spots near sun's meridian. 13th, 1 new group 1 day in east. 17th, large spot that disappeared in west on the 1st reappeared in east. 18th, 1 new spot near east edge. 21st, 1 new group near east edge. 24th, 1 new spot on east edge south latitude. 25th, 2 small spots. 26th, 1 faint group 3 days in on east. 27th, group of 13th disappeared on west edge; 2 new spots in sw. 28th, 1 new spot on east edge; prominent faculæ on west limb. 30th, 2 new spots, 2 days in; faculæ on west limb. 31st, all spots gone, except groups of 21st and 28th.

Mr. H. D. Govey, North Lewisburgh, Ohio: sun spots were observed on the 1st, 2d, and 6th to 31st.

Haverford College Observatory, Pa. (observed by Prof. F. P. Leavenworth):

Date.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.		
May, 1891.										
1, 10 a. m.	2	12	0	0	0	0	4	29	2	Definition good.
2, 10 a. m.	1	6	1	5	0	0	3	13	2	Definition good; 1 large spot.
3, 2 p. m.	0	0	1	2	0	0	1	2	2	Definition fair.
4, 12 m.	3	9	0	0	0	0	4	12	4	Definition poor; 1 large spot.
5, 12 m.	0	0	0	0	0	0	2	10	2	Definition poor; 2 large spots.
6, 9 a. m.	0	0	0	0	0	0	2	10	2	Definition poor; 1 large spot.
7, 6 a. m.	1	1	0	0	0	0	3	10	2	Definition poor; 1 large spot.
8, 12 m.	2	3	0	0	0	0	4	35	3	Definition good.
9, 9 a. m.	1	1	0	0	0	0	4	44	3	Definition good.
10, 8 a. m.	1	1	0	0	0	0	4	77	0	Definition good; 1 large spot.
11, 4 p. m.	2	2	0	0	0	0	6	40	3	Definition fair; 4 large spots.
12, 10 a. m.	1	1	1	2	0	0	6	37	4	Definition fair; 2 large spots.
13, 10 a. m.	2	7	1	1	0	0	6	16	4	Definition poor; 3 large spots.
14, 10 a. m.	0	0	0	0	0	0	4	32	1	Definition fair.
15, 10 a. m.	1	3	0	0	0	0	4	32	3	Definition good; 4 large spots.
16, 9 a. m.	0	0	0	0	0	0	5	55	3	Definition fine; 4 large spots.
17, 10 a. m.	0	0	0	0	0	0	5	40	1	Definition fair; 4 large spots.
18, 9 a. m.	2	4	0	0	0	0	7	59	2	Definition fair.
19, 9 a. m.	2	4	0	0	0	0	9	81	2	Definition fair.
20, 1 p. m.	0	0	0	0	0	0	3	18	0	Definition bad.
21, 12 m.	1	1	0	0	0	0	5	46	3	Definition poor; 1 large spot.
22, 9 a. m.	0	0	1	3	0	0	3	30	1	Definition fair; 1 large spot.

VERIFICATIONS.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for 48 and 72 hours, covering the 2d and 3d days in advance. These are optional with the forecast official, and are only made when clearly in the public

interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications made for second day in advance. Number of predictions made: weather, 92; temperature, 37. Percentages of verifications: weather, 91.8; temperature, 97.0; weather and temperature combined, 93.0.

Percentages of verifications for third day in advance. Number of predictions made, temperature, 4. Percentage of verification, 100.

WIND SIGNALS FOR MAY, 1891.

Statement showing percentages of justifications of wind signals for the month of May, 1891.

Wind signals—(Ordered by Assistant Professor H. A. Hazen.)—Total number of signals ordered, 76; justified as to velocity, wholly, 60, partly, 1; justified as to direction, 73. All of the signals ordered were cautionary; 36 signals were ordered for easterly winds, of which 33 were justified, and 40 were ordered for westerly winds, all of which were justified. Percentage of justifications, 73.0.

No cold-wave signals were ordered, and no temperature-fall warnings were issued during the month.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for May, 1891.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	84	79	New Jersey	79	90
Iowa	89	92	New York	86	81
Michigan	88	88	North and South Dakota	88	77
Minnesota	93	83	Ohio	89	89
Missouri	86	89	South Carolina	80	88
Nebraska	83	91			

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

FORECASTS FOR 24 HOURS IN ADVANCE.

The forecasts for districts east of the Rocky Mountains for May, 1891, were made by Assistant Professor H. A. Hazen, Signal Service, and those for the Pacific coast districts were

made at San Francisco, Cal., by 2d Lieutenant John P. Finley, 19th Infantry.

Percentages of forecasts verified, May, 1891.

States.	Weather.	Temperature.	Weather and temperature combined.	States.	Weather.	Temperature.	Weather and temperature combined.
Maine	88.1	67.1	79.7	Arkansas	84.2	80.6	82.8
New Hampshire	82.9	72.9	78.9	Tennessee	90.6	79.0	86.0
Vermont	87.4	77.7	83.5	Kentucky	93.5	74.2	85.8
Massachusetts	91.6	80.6	87.2	Ohio	89.2	71.3	79.6
Rhode Island	91.0	84.8	88.5	West Virginia	86.1	64.5	77.5
Connecticut	90.3	81.9	87.0	Indiana	91.0	78.7	86.1
Eastern New York	88.4	75.5	83.2	Illinois	90.6	86.1	88.8
Western New York	84.5	67.1	77.5	Lower Michigan	92.6	74.8	85.5
Eastern Pennsylvania	87.4	78.7	83.9	Upper Michigan	93.2	77.4	86.0
Western Pennsylvania	80.3	71.3	76.7	Wisconsin	89.7	75.5	84.0
New Jersey	81.4	76.8	79.5	Minnesota	91.6	82.3	87.9
Delaware	86.1	81.3	84.2	Iowa	91.0	79.0	86.2
Maryland	86.1	88.1	86.9	Kansas	84.8	80.0	82.9
District of Columbia	80.3	87.1	83.0	Nebraska	89.0	84.5	87.2
Virginia	89.0	77.7	84.0	Missouri	89.4	89.7	89.5
North Carolina	91.0	80.6	86.5	Colorado	86.1	72.9	80.8
South Carolina	90.3	82.3	87.1	North Dakota	89.4	86.8	88.3
Georgia	91.0	90.0	90.6	South Dakota	91.0	83.5	88.0
Eastern Florida	91.6	94.5	92.8	Southern California	95.8	79.0	89.1
Western Florida	95.8	95.8	95.4	Northern California	90.3	80.3	86.3
Alabama	92.6	85.5	89.7	Oregon	88.1	68.1	80.1
Mississippi	92.3	84.2	89.0	Washington	85.5	72.6	80.3
Louisiana	90.6	88.7	89.9				
Texas	89.7	80.6	86.1	Monthly percentage	88.0	80.3	85.4

In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. The forecasts of temperature in districts east of the Rocky Mountains for May, 1891, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for May, 1891, of the directors of the various state weather services:

ALABAMA.

Cool weather and drouth injured vegetation.

Temperature.—The mean was 5.0 below the normal; maximum, 99, at Wiggins, 25th; minimum, 36, at Chepultepec, 7th; greatest monthly range, 54, at Brewerton and Opelika; least monthly range, 22, at Goodwater.

Precipitation.—Greatest monthly, 4.09, at Double Springs; least monthly, 0.00, at Chepultepec.

Wind.—Prevailing direction, north.—*Prof. P. H. Mell, Auburn, director; J. M. Quarles, Private, Signal Corps, assistant.*

ARKANSAS.

The month was much colder and drier than usual.

Temperature.—The mean was 2.4 below the normal; maximum, 97, at Lead Hill, 30th; minimum, 36, at Fayetteville, 7th; greatest monthly range, 59, at Lead Hill; least monthly range, 20, at Winslow.

Precipitation.—The average was 1.17 below the normal; greatest monthly, 5.37, at Hot Springs; least monthly, 0.55, at Devall Bluff.

Wind.—Prevailing direction, south.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; F. H. Clarke, Sergeant, Signal Corps, assistant.*

COLORADO.

Temperature.—Maximum, 93, at Lamar, 8th; minimum, 1, at Breckenridge, 11th; greatest monthly range, 73, at Breckenridge; least monthly range, 40, at Como and Leadville.

Precipitation.—The average was considerably above the normal; greatest monthly, 8.67, at Brush; least monthly, 0.49, at Garnet.—*W. S. Miller, Sergeant, Signal Corps, Denver, assistant.*

ILLINOIS.

Temperature.—The mean was 3.1 below the normal of the last 13 years; maximum, 93, at McLeansborough, 31st; minimum, 28, at Oswego, 17th, at Philo, 7th, and at Pontiac, 6th.

Precipitation.—The average was 2.07 below the normal of the last 13 years; greatest monthly, 4.74, at Rushville; least monthly, 0.47, at Pontiac.

Wind.—Prevailing direction, northeast.—*John Craig, Sergeant, Signal Corps, Springfield, in charge.*

INDIANA.

Temperature.—Maximum, 90, at Rockville, 30th; minimum, 25, at Point Isabel, 5th and 7th; greatest monthly range, 63, at Point Isabel; least monthly range, 40, at Huntingburgh.

Precipitation.—Greatest monthly, 2.79, at Valparaiso; least monthly, 0.30, at Huntingburgh.

Wind.—Prevailing direction, northeast.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA WEATHER AND CROP SERVICE.

Temperature.—The mean was about 2.0 below the normal; maximum, 94, at Glenwood, 14th; minimum, 21, at Indianola, 6th; greatest monthly range, 62, at Atlantic; least monthly range, 39, at Independence.

Precipitation.—The average was about 1.25 below the normal; greatest monthly, 7.10, at Mount Vernon; least monthly, 1.46, at Bancroft.

Wind.—Prevailing direction, northeast.—*J. R. Sage, Des Moines, director; G. M. Chappel, Observer, Signal Service, assistant.*

KANSAS.

Temperature.—The mean was 2.5 below the normal; maximum, 98, at Morton, 30th; minimum, 27, at Pleasant Dale, 11th; greatest monthly range, 66, at Eureka Ranch; least monthly range, 42, at Wallace.

Precipitation.—Greatest monthly, 10.25, at Kellogg; least monthly, 1.50, at Page City.

Wind.—Prevailing direction, south.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

Temperature.—The mean was about 4.0 below the normal; maximum, 90, at Canton and Princeton, 31st; minimum, 29, at Caddo, 6th, and at Harrodsburgh, 7th; greatest monthly range, 59, at Princeton; least monthly range, 43, at Franklin.

Precipitation.—The average was about 2.00 below the normal; greatest monthly, 3.96, at Middlesborough; least monthly, 0.76, at Bowling Green.

Wind.—Prevailing direction, northeast.—*Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.*